

Original Research

A training program incorporating a diabetes tool to facilitate delivery of quality diabetes care by community pharmacists in Malaysia and Australia

Shamala AYADURAI^{ID}, Bruce SUNDERLAND^{ID}, Lisa B. TEE, H. Laetitia HATTINGH^{ID}.

Received (first version): 26-Jan-2019

Accepted: 2-Jun-2019

Published online: 14-Jun-2019

Abstract

Objectives: To assess a clinical training program on management of Type 2 Diabetes Mellitus (T2DM) incorporating a diabetes tool, the Simpler™ tool. Subsequently pharmacists' experience utilising the tool to deliver structured, consistent, evidence-based T2DM care was explored.

Methods: Full-time non-credentialed diabetes pharmacists providing diabetes medication management services in community settings were purposively recruited. Participants had either face-to-face or online training on diabetes management using the tool which took about two hours and 20 minutes to complete. Their diabetes management knowledge was assessed pre- and post-training using quantitative methodology. They were then required to apply the tool in daily practice for one month. Feedback on both the training sessions and tool utilisation were obtained through semi-structured interviews and analysed using a qualitative approach.

Results: Twelve pharmacists participated: Six from Australia and six from Malaysia. Before attending the training session, their median test score was 6.5/27, IQR 1.4 (1st marker) and 5.3/27, IQR 2.0 (2nd marker). After training, the scores doubled to 14.3/27, IQR 4.5 (1st marker) and 11.3/27, IQR 3.1 (2nd marker), showing significant improvements ($p=0.002$). Interview data identified perceived effectiveness factor through use of the tool. Participants found the content relevant, structured, concise and easy to understand; enabled comprehensive medication reviews; focused on achieving glycaemic improvement; facilitated documentation processes and pharmacists' role in T2DM management; and as a specific aid for diabetes management. Barriers included lack of accessibility to patients' laboratory data in Australia.

Conclusions: The targeted training improved pharmacists' knowledge on diabetes management and supported the Simpler™ tool use in practice as a structured and beneficial method to deliver evidence-based T2DM care.

Keywords

Education, Pharmacy, Continuing; Diabetes Mellitus, Type 2; Blood Glucose; Documentation; Pharmacists; Pharmaceutical Services; Evaluation Studies as Topic; Malaysia; Australia

INTRODUCTION

Health professionals are required to be knowledgeable about the need for appropriate glycaemic control and measures to prevent long-term diabetes complications. Diabetes caused 1.6 million deaths worldwide in 2016 which was an increase from 1 million in 2000.¹

Type 2 diabetes mellitus (T2DM) guidelines cover seven evidence-based factors to be addressed in the management of patients to reduce diabetes related problems.²⁻⁵ Those are glycaemia, cholesterol and blood pressure control, medication, lifestyle, cardiovascular disease risk management and patient education. Despite the evidence, the incidence of complications remains high, both in Malaysia and Australia.⁶ One reason may be a lack of a structured approach focused on addressing these seven factors in diabetes intervention studies. While some studies showed an intervention improved patients'

glycated haemoglobin (HbA1c) values, others showed no significant changes.⁷⁻¹² Pharmacists' contribution to optimise medication therapy have been widely documented.¹³ Yet, pharmacists express the need for further training to upskill their competence in managing chronic conditions.¹⁴ To address these issues, a pharmacist diabetes intervention tool, the Simpler™ tool, was developed to facilitate the delivery of structured, evidence-based quality care. To date, there is a lack of diabetes intervention studies which address the seven factors covered in the guidelines. This provided an opportunity to develop a tool that facilitated the provision of structured targeted diabetes care of consistent quality. The tool consists of seven diabetes factors and 32 corresponding evidence-based indicators according to diabetes practice guidelines. The indicators were originally sourced from diabetes practice guidelines from Australia, Malaysia the United Kingdom (UK) and the United States of America (USA).²⁻⁵ The Simpler™ tool serves as a structured aide memoir for pharmacists. The tool aims to prompt pharmacists to address all seven diabetes factors and its indicators. While Australia's and Malaysia's healthcare systems may differ, the diabetes practice guidelines and existing pharmacist led diabetes medication management service (MMS) are similar. The Simpler™ training was developed to standardise the application of the tool in provision of MMS services such as Diabetes MedsCheck in Australia and Diabetes Medication Therapy Adherence

Shamala AYADURAI. School of Pharmacy and Biomedical Sciences, Curtin University. Perth, WA (Australia).
shamala.ayadurai@postgrad.curtin.edu.au

Bruce SUNDERLAND. School of Pharmacy and Biomedical Sciences, Curtin University. Perth, WA (Australia).
B.Sunderland@curtin.edu.au

Lisa B G TEE. School of Pharmacy and Biomedical Sciences, Curtin University. Perth, WA (Australia). L.Tee@curtin.edu.au

H. Laetitia HATTINGH. School of Pharmacy and Pharmacology, Griffith University. Gold Coast, QLD (Australia).
L.Hattingh@griffith.edu.au

Clinic in Malaysia. The development of the Simplertm tool was facilitated by a Delphi process and was validated between September and December 2014 and described in a previous study.¹⁵ The aim of this study was to evaluate a training program for non-diabetes credentialed pharmacists on management of T2DM using the Simplertm tool and subsequently explore their experiences of utilising the tool when providing MMS.

METHODS

This study involved the development and assessment of a training program that incorporated the use of the Simplertm tool. Pharmacists' knowledge was assessed pre- and post-training through a questionnaire. The same pharmacists subsequently applied the tool in practice for one month and their experiences were obtained through semi-structured interviews. Their perception of the training program and the utilisation in practice was assessed using a qualitative approach. This pilot study was conducted as part of a larger project and preceded a randomised controlled study.¹⁶ This study received ethics approvals from the Curtin University Human Research Ethics Committee (RDHS-06-14), Western Australia and the Medical Research & Ethics Committee (MREC), Ministry of Health Malaysia.

Participant recruitment

Pharmacists targeted were community pharmacists involved in the provision of diabetes care to patients, in full-time employment but non-diabetes credentialed pharmacists. The literature on sample size determinants for a qualitative study suggested a sample size between five and 25.^{17,18} Taking this factor into consideration and pharmacists' potential time constraints, 13 potential participants were approached through personal contacts of the researchers and a snowball recruitment process.^{19,20} They were invited by email and were provided with an information sheet about the research and had the

opportunity to ask questions before providing consent.

Quantitative assessment of the training program

Participants were required to complete a training session. The overall goal of the training was to enhance participants' understanding of the pharmacist's role in providing diabetes care and incorporated demonstrating how the Simplertm tool facilitated the provision of structured diabetes care. Emphasis was placed on how the tool assisted in identifying the reasons for therapeutic failure and resolve the issues by providing evidence-based suggestions through application of a systematic approach. The training program was developed by the primary author (SA) and the overall syllabus details are presented in Table 1.

Pre- and post-evaluation questions (in the format of questionnaires) and training modules were peer-reviewed by three pharmacist academics with specialist diabetes knowledge. The face, content and usefulness were subsequently validated, and pilot tested by two Australian and two Malaysian pharmacists experienced in the management of diabetes patients who provided further feedback. Adjustments to the modules were subsequently made. Some pharmacists had a face-to-face workshop while others received online training. Since the first author was in Australia at the time of the study, face-to-face training sessions for the Australian participants were offered in the first instance, followed by e-learning sessions for the Malaysian participants. The same presentation slides were used for both the face-to-face and the online training sessions. In addition, the voice-over of the presentation slides followed a standardised script. The recorded training modules were uploaded to a cloud file storage service which allowed large file viewing. Sharing and access to the file was provided to participants via email. Pharmacists had the opportunity to ask questions during face-to-face workshops and those doing the online training through various channels including social media.

Module no.	Module title	Module content	Module goals
1.	Introduction	<ol style="list-style-type: none"> 1. Describe the pharmacist's role in management of T2DM 2. Explain the research objectives and significance 3. Outline the research plan and present findings from the Simplertm tool development and validation phase 	To provide an overview and understanding of pharmacists' role in diabetes management.
2.	Simplertm tool validation	<ol style="list-style-type: none"> 1. Outline and describe the seven indicators incorporated into the Simplertm tool 2. Explain the benefits of the Simplertm tool using evidence-based information 	To help pharmacists understand the Simplertm tool development and evaluation process to increase confidence in its usage
3.	Case study discussion	<ol style="list-style-type: none"> 1. Outline the information gathering process 2. Practise effective interventions using the Simplertm tool 	To analyse the causes of therapeutic failure in case study examples. To demonstrate and apply the Simplertm tool to solve the issues. To justify each suggestion with evidence-based information using the Simplertm tool
4.	Writing intervention notes	Writing case notes/*Guild Care using the Simplertm tool	To compose patient notes using a systematic approach for writing

*Guild Care refers to the software used by some Australian community pharmacists to record and report patient information [<http://www.guildlink.com.au/guildcare/about-us/>]. T2DM= Type 2 diabetes mellitus

Upon completion, participants attending the face-to-face training completed the post-training questionnaire while participants who followed the online training informed the researcher (SA) and were subsequently sent the post-training questionnaire by email. Both groups had access to notes and the Simpler™ tool when completing the post-training questionnaire.

The pre-training questionnaire consisted of two sections: Section A included five closed-ended questions directed at participants' training background and current practices, and Section B consisted of two open-ended questions on a patient's case scenario aimed to test participants' knowledge of diabetes guidelines and their skills in suggesting medication management interventions. The post-training questionnaire contained the same questions in Section B of the pre-training questionnaire. The pre-and post-training questionnaire is shown in Online Appendix. The questionnaire was face and content validated by the same pharmacists who pilot tested the training modules. Participants' answers were marked by two markers using a written marking scheme validated by an independent pharmacist. Each answer had point/s awarded and the scores were marked out of 27.

Qualitative assessment of the training program and tool utilisation in practice

Upon completion of the training, the same participants

were given one month to apply the tool in their practice settings. They were provided with a template to record the number of times the tool was used on patients and the types of interventions conducted by utilising the tool. A unique identification number was allocated indicating where the participant originated: participants were assigned the letter P and numbered 1 to 6. The letter A was assigned to participants from Australia (example P1A) and those from Malaysia the letter M (example P1M). This allowed to differentiate participants' perception of the tool from both countries as the two healthcare systems differed.

Semi-structured interviews were conducted by SA (July to August 2015). Face-to-face interviews were conducted with two pharmacists at their workplaces and two at a university. Telephone interviews were conducted with the remaining eight pharmacists. The interview process followed Kvale's seven stages for conducting interviews and the requirements of consolidated criteria for reporting qualitative research guidelines (COREQ).^{21,22} The interview guide consisted of three sections, sections A, B and C, presented in Table 2. The interviewer followed the interview guide while allowing opportunity for probing questions and clarifications. The interview guide was pilot tested with two independent pharmacists.

Participants could raise points during the interview that

Table 2. Interview Questions Used to Guide the Interview Process	
Section A: Details and experience of pharmacist	
1.	What is your age?
2.	Were you trained to practise Diabetes MedsCheck/ medication therapy adherence clinic (MTAC) diabetes?
3.	If yes, how did you undertake this training?
4.	Do you have any post-graduate qualifications? If yes, what qualifications?
5.	On average, how many hours do you work per week in the community setting?
6.	How many years have you been practising as a pharmacist in the community?
7.	In which year did you first obtain your registration to practise as a pharmacist?
8.	How would you consider your current role in the pharmacy? Prompt: Dispensary pharmacist, patient care-focused, managerial role, MTAC diabetes/Diabetes MedsCheck pharmacist, clinical pharmacist....
Section B: Previous and current experience in providing diabetes medication management service (MTAC diabetes, Diabetes MedsCheck)	
1.	On average, how many patients do you provide the service to in a day/week/month?
2.	How do you normally review patients? Prompt: use MTAC diabetes/Diabetes MedsCheck checklist, own checklist, tools from the web, etc
3.	How often do you refer to the Australian/Malaysian guidelines on diabetes?
Section C: Experience in using Simpler™ tool	
1.	Please comment on your experience in using the Simpler™ tool. Prompts: a. Relevance when reviewing patient? b. Ease of Use? Content simple to understand? c. Relevance to local practice and guidelines? d. Managing consultation time with patients? e. Intervention format? f. Ease of remembering? g. Guide pharmacists to make interventions? h. Record intervention notes in a consistent, structured manner? i. Clarity of tool? j. Providing evidence-based information to physician, patients?
2.	On how many patients did you use the Simpler™ tool?
3.	Talk about the interventions you made using the Simpler™ tool.
4.	Are the medication reviews with patients with diabetes different now compared to when you were not using the Simpler™ tool? If yes in what way?
5.	How was the Simpler™ training session? Prompt: suggestions for improvement
6.	Would you recommend the Simpler™ tool to other community pharmacists?
7.	Are there any recommendations you like to make to enhance the usability of the tool?
8.	Thank you again for your time. Before we finish, do you have any comments you'd like to make, about the research topic or training or about the interview?

	Mean (SD)			Median (IQR)			Min	Max
	A	M	Total	A	M	Total		
Age (years)	30.7(8.6)	29.8(5.1)	30.3(6.8)	27(8)	28(9.8)	27 (7.8)	25	48
Working hours/week	42.5(3.0)	38.5(0)	40.5(2.9)	43.5(5.5)	38.5(5.8)	38.5(5.8)	38	45
Years practising as pharmacist	7.3(9.7)	4.2(3.4)	5.7(7.1)	3.6(8)	2(6)	2.6 (5)	2	27
Average patients provided service to during research period	3(2)	10(5.5)	7(5.4)	2(4)	10(7)	6(8)	1	20

A=Australia, M=Malaysia, Min=Minimum, Max=Maximum, IQR=Interquartile Range, SD=standard deviation

were not included in the interview guide if these were relevant to the overall aim of the study. The interviews ended when all questions were exhausted and no new information was obtained (interviews reached a saturation point).²³ Interviews were audio recorded and transcribed verbatim by SA. Audio recordings were saved with a unique identification code to protect participants' anonymity. A project supervisor (HLH) conducted quality checks of transcripts against audio recordings.

Data analysis

Differences between the pre- and post-training questionnaire responses were analysed using the Wilcoxon Signed Rank Test for non-parametric testing as the sample did not meet the requirements for normal distribution. SPSS statistical package version 22 was used for the quantitative analysis.²⁴

Descriptive analyses were used for closed-ended interview questions (Sections A and B of the interview guide) whilst thematic analysis was used for the open-ended questions (Section C) to gain insight into pharmacists' opinions, views and perceptions of the Simpler™ tool. In addition, the open-ended questions were used as a guide to identify emerging patterns. An inductive process was followed throughout the analysis and recurring topics from the interview data were investigated using the qualitative framework method as suggested by Boyatzis.²⁵ Participants' raw data were highlighted in order to determine sentences or keywords which were then assigned a label called 'codes'. The codes were then sorted into topics. Different views under the same topic were grouped as a subtopic. Transcripts were then scrutinised again for new or emerging topics. The coding process was performed by SA and project team members verified the analytical process before finalising the analysis. NVivo qualitative analysis software version 10 was used to categorise and organise the qualitative data.²⁶

RESULTS

Participant characteristics

Of the 13 pharmacists approached, 12 consented to undertake the study. There was equal representation of participants from Malaysia (n=6) and Australia (n=6). Most participants (75%, 9/12) had less than three years' experience of conducting diabetes management. Table 3 presents participants' demographic data and practice experiences.

Interestingly, the majority of participants (66.7%; 8/12) had never or only sometimes referred to the Australian or Malaysian diabetes practice guidelines when providing diabetes MMS.^{2,3,27} Regarding the question "What

motivated you to participate in this research?" most participants ranked interest in the subject (83.3%;10/12) and improve patients' outcomes (91.7%; 11/12) as the main incentive.

Quantitative assessment of training program

1) Pre- and post-training questionnaire

There was a significant improvement in post-training questionnaire scores (P=0.002) by both markers. Before attending the training session, the participants' median test score was 6.5/27, interquartile range (IQR) 1.4 (1st marker) and 5.3/27, IQR 2.0 (2nd marker). After attending the training session, the scores doubled to 14.3/27, IQR 4.5 (1st marker) and 11.3/27, IQR 3.1 (2nd marker), showing significant improvements (p=0.002). Pharmacists initially struggled to frame better questions to make meaningful interventions. However, post-training results showed a marked improvement in addressing the seven diabetes factors to facilitate the intervention process.

Qualitative assessment of the training program and tool utilisation in practice

All 12 pharmacists participated in the semi-structured interviews. The average duration of the interviews was 32 minutes with the face-to-face interviews ranging between 19 to 32 minutes (mean 26 minutes) and the telephone interviews between 16 to 54 minutes (mean 36 minutes). Most participants (91.7%; 11/12) used the Simpler™ tool to facilitate their intervention process. Those included: to add a statin to achieve cholesterol targets; initiate metformin in patients with uncontrolled diabetes; dose adjustments and improving medication adherence. One participant did not use the tool as this participant only focused on lifestyle factors during patient consultations. The participant therefore expected more detailed counselling points on lifestyle management. Participants reported making interventions using one or more tool indicators. The types and number of interventions made are provided in Table 4 with supporting quotations.

Interview analysis revealed patterns that were grouped into three main topics. Those were:

- Perception of training program (interview guide question 5 of Section C),
- Perceived effectiveness of the Simpler™ tool (from various questions), and
- Barriers to the Simpler™ tool utilisation (interview guide questions 1,3,4,6 of Section C).

1) Perception of the training program

Table 4. Types and number of interventions made by pharmacists using the Simplertm tool

Corresponding letter of Simplertm tool	Number of total interventions	Type of Interventions	Supporting quotes
S (Statin/Cholesterol control)	4	Initiate statin	So basically with [the] first patient, he was not on [a] statin, with Simplertm that's the first thing I spoke to him about, because he is at high risk (P7A)
I (Insulin/glycaemic control)	7	Suggestion to initiate metformin	My first patient was not on metformin even though [it] is not contraindicated. (P6M)
		Initiate insulin	Patients with HbA1c constantly above 7%, I gave suggestions to start insulin. (P1M)
M (Medication management)	10	Patient's compliance	Yes, it was simply compliance because he was not seeing that this medication is necessary for him and that includes his diabetes medication (P3A)
		Medication related problems identified	Because blood sugar is not controlled, [the] doctor increased [the] metformin dosage from 1g to 2g but the script is for just immediate-release metformin 1g, 2 tablets at night which is the wrong dose because immediate-release dosing should be 1 tablet twice daily (P5A) I managed to do a quick medication review and found that his lipid dose, fenofibrate, was too high for a patient with creatinine clearance of 45 and I suggested [to the] doctor to change it to 96mg daily rather than 145mg daily. (P5A)
L (Lifestyle management)	8	Diet, foot care, body mass index	... I did a lot was lifestyle, when we talked about lifestyle she had hypoglycaemia so we talked about hypoglycaemia. This other patient has her BMI as 29 so we talked about BMI. She is quite eager so we talked about plate model. (P2A) His diabetes levels weren't well controlled and when we went through Simplertm, I realised his diet wasn't very healthy. So, I went through the diet and he also mentioned that he doesn't check his feet regularly as well because with diabetes you need to get your foot checked regularly so I advised him the importance of checking his foot regularly. (P4A)
R (CVD risk reduction strategies)	3	Suggestion to initiate aspirin based on Framingham risk score	Based on that, the patient fit the criteria to start aspirin, therefore I advised the patient and recorded the intervention (P1M)

Most participants (83.3%; 10/12) commented that the training module content was adequate and relevant. In addition, they found the length of training appropriate. The majority believed the Simplertm training session increased their knowledge and confidence in evidence-based diabetes management and for some it served as a refresher. Participants provided positive comments on the training sessions overall. The supporting participants' quotations on the training session are presented in Table 5.

Improvements to the Simplertm training modules included to: 1) add an intervention recording template to document interventions in patients' medical records (PMR), 2) develop a flow chart to illustrate the information gathering process before the Simplertm tool application, 3) include more slides on identifying medication related problems, 4) add information on glucagon use, and 5) add materials on lifestyle management.

2) Perceived effectiveness of the Simplertm tool in practice

All 12 participants found the Simplertm tool to be beneficial when conducting medication reviews with patients. Participants used words such as 'organised', 'sequential', 'straight to the point', 'my accounting made relevant', 'compact', 'complete' and 'easiest tool' to describe the benefits. Participants from both Malaysia and Australia expressed their reliance on the Simplertm tool when conducting MMS as they considered it to be a point of reference. All participants expressed the tool as an 'aide

memoir' in recollection of the factors associated with diabetes management.

Eight specific issues were identified on the perceived effectiveness of the tool, summarised with corresponding quotations in Table 5. The Simplertm tool allowed participants to conduct more comprehensive reviews during consultations. Of specific interest was that one participant found that the tool made diabetes medication reviews more purposeful as improving patients' glycaemia levels became the focus. However, three of the participants found the tool time consuming to use. However, they indicated that the benefits of being able to conduct detailed and organised patient assessments outweighed the time factor. A common view amongst participants was that the tool facilitated the writing of interventions in PMR (Malaysia) and in software programs (Australia). In addition, one participant felt the tool promoted her to have a more specialised role in diabetes management and thus found the tool specifically targeted for diabetes management.

3) Perceived barriers

Two specific issues were identified on the perceived barriers to the effective use of the tool, as summarised in Table 5. Two Australian participants found the limited access to patient's medical data a barrier and was therefore unable to make a meaningful intervention while one

Table 5. Perception of training and perceived effectiveness and barriers of Simpler™ tool application with quotations	
Topic: Perception of the training program	
Subtopic	Supporting quotations
Increased knowledge on evidence-based diabetes management	<i>In my practice, I learn something new because previously I did not write any intervention, I mean I just counselled the patient based on their medication but now I am comfortable to make an intervention. (P1M)</i>
Increased confidence to provide diabetes care	<i>You know what's good, the example you gave us in the Simpler™ training of the little lecture that you sent to the doctor about the patients that is helpful. But I haven't sent anything to the doctor, but I still have the confidence to send the doctor something like that. (P7A)</i>
Useful as a refresher	<i>"It reminded me, I mean like a revision. The Framingham score for example, I forgot about that." (P6M)</i>
Topic: Perceived effectiveness of the Simpler™ tool	
Subtopic	Supporting quotations
Content relevant, structured, concise and easy to understand	<i>Well I think that diabetes is so overwhelming, you just don't know where to start, how to begin so having a structured approach is very beneficial. (P6A) I think this is straight to the point. The existing guide for pharmacists, can be irrelevant and quite time consuming for us to go through. (P5A) Simpler™ tool is a compact tool and one of the easiest. In one word, you can summarize everything. (P1M)</i>
Point of reference	<i>Yes, because all the indicators in the tool are proven from local guidelines and Australian guidelines so no one will dispute the contents. (P2M) So far, I rely heavily on the tool because it has all the targets and it is based on Australian guidelines. (P2A)</i>
Reminder of factors associated with diabetes management (aide memoir)	<i>Patients deviate, I come back I might have missed the blood pressure component but with the tool, when they deviate, I need to go through the checklist, all these points, so it's a good thing. (P3A)</i>
Able to conduct comprehensive medication review	<i>I go a bit thorough and ask more questions according to the tool and find out a little more and counsel and educate patients a little bit more. So, usually when I'm doing my diabetes MedsCheck, I run through what's on the existing software program but then it's not enough so the Simpler™ tool pushes [me] to do a bit more. (P7A) Initially when we first applied it, since I was not familiar, it was more time consuming. The whole session took me about an hour for the first patient. (P5A) I need to go through all these checklists, all these points, so it's a good thing, it's longer but in a good way... (P3A).</i>
Focus on glycaemic improvement	<i>Before this we only focussed on the education part, now the interesting part is the aim to reduce HbA1c. (P4M)</i>
Facilitate documentation of interventions	<i>Because I'm using Simpler™, I wrote clearly inside the patients' book, the doctor complimented that it was good and well written. They salute the pharmacy, but before this I only used simple words and my notes were incomplete. (P4M)</i>
Facilitated pharmacist role in diabetes management	<i>Really good thing and I think if a pharmacist can set themselves up to be a specialist in diabetes management through using the Simpler™ tool reporting back to the GP with six monthly progress. (P6A)</i>
Specific aid for diabetes management	<i>That one you have to print from the Guild Care program [software to support provision of professional services] itself. Yes...You have to click, you just register your patients and you just print it out. It doesn't ask anything...all it asks is, does this patient have T2DM? And then classifies as diabetes MedsCheck so it doesn't have what Simpler™ has, specifically for patients with diabetes. (P3A)</i>
Topic: Barriers to effective use of the Simpler™ tool	
Subtopic	Supporting quotations
Unable to make intervention unless a Home Medicine Review (HMR) pharmacist	<i>It's fine but the only thing from the Simpler™ tool I found that it would be much more applicable for an HMR pharmacist as opposed to a regular pharmacist in a pharmacy unless that pharmacist has been specifically trained in or even a diabetes educator. (P3A)</i>
Difficult to access laboratory results (Australia)	<i>The only thing with diabetes MedsCheck and using the tool is that I can't have access to their blood HbA1C results and I even tried to get it from the surgery. (P2A) It was just at one point there was not enough laboratory test results. In fact, when I did medication review using Simpler™, I could only say" 'Yes that there is statin' but I do not know what the statin level was and what the cholesterol level was. (P3A)</i>

believed accredited pharmacists providing home medicine reviews service were better suited to make interventions.

Participants provided the following suggestions to further refine the Simpler™ tool:

- Use visual prompts
- Larger font for headings
- Use either Malaysian or Australian targets

- Use terms like Asian or Caucasian for body mass index targets

Based on these suggestions, the tool was further refined as presented in Table 6.

DISCUSSION

Table 6. The refined Simplertm pharmacist diabetes intervention tool	
S=Statin	<ul style="list-style-type: none"> • Statin initiation in patients with CVD • ^aAchieve targets for LDL and TG • Statin initiation in patients > 40 years old without CVD
I=Insulin/Glycaemic control	<ul style="list-style-type: none"> • Insulin initiation if glycaemic control not achieved despite being on two or more oral hypoglycaemic agents • Target of HbA1c ≤ 7% if no other complications • Management of hypoglycaemia • ^bSelf-monitoring of blood glucose • Aim a reduction of HbA1c by 1% if above target HbA1c • Initiate/continue metformin if not contraindicated
M=Medication	<ul style="list-style-type: none"> • Assess medicine related problems • Review medication adherence
P=Blood Pressure	<ul style="list-style-type: none"> • ^cAchieve BP target • ACEI/ARB initiation in patients with/without microalbuminuria /proteinuria • Reduce sodium intake (<2400mg sodium/day; 6g/1 teaspoon/day) • One or more antihypertensive medicine to be taken at bedtime
L=Lifestyle	<ul style="list-style-type: none"> • Exercise: 30 mins walking (or equivalent) 5 or more days/week (total ≥150 min/week) • Weight loss: Caucasian (BMI< 25 kg/m²), Asian (BMI ≤ 23 kg/m²) • Smoking cessation • Waist circumference: Caucasian (<94 cm in men, <80 cm in women, Asian (≤90 cm in men, ≤80cm in women) • Alcohol intake: ≤2 standard drinks (20 g) per day for men • Management of stress & diabetes related distress • Erectile dysfunction: recommend Phosphodiesterase-5 inhibitor as first line therapy for male patients • Foot care • Diet advice using plate model • Annual eye assessment • Address sleep hygiene
E=Education	<ul style="list-style-type: none"> • Knowledge & understanding of medicine • Medicine storage • Medication optimisation during fasting month for Muslims and other religious groups
R=Cardiovascular Risk	<ul style="list-style-type: none"> • Aspirin therapy as secondary prevention in those with diabetes with history of CVD • Use of Framingham risk calculator to calculate CVD risk and educate patients • ^dAspirin therapy (75mg-162mg/day) as primary prevention to decrease CVD risk (10 year risk>10%, Framingham)
<p>^aAustralia: Low density lipoprotein(LDL) <2.0 mmol/L, Triglyceride (TG) <2.0 mmol/L, Malaysia: LDL <2.6 mmol/L, TG <1.7 mmol/L ^bAustralia: (6.0-8.0 mmol/L fasting),(8.0-10.0 mmol/L-2h postprandial); Malaysia:(4.4-7.0 mmol/L fasting),(4.4-8.5 mmol/L-2h postprandial) ^cAustralia:≤140/90 mmHg, with albuminuria/proteinuria<130/80 mmHg; Malaysia: ≤135/75 mmHg ^dRecommendations according to 2016 ADA Standards of medical care in diabetes⁵; Malaysia Clinical Practice Guidelines recommend aspirin therapy if 10 year risk>10% only for patients aged 65 years and above² ACEI=Angiotensin converting enzyme inhibitors; ARB= Angiotensin 11 receptor blockers; BP= Blood pressure; BMI=Body mass index; CVD=Cardiovascular disease; HbA1c=glycosylated haemoglobin and reflects average glycaemia the preceding 6-8 weeks LDL=Low density lipoprotein; TG=Triglyceride</p>	

This study employed qualitative methodology to identify underlying topics related to the use and effectiveness of the Simplertm tool in providing a structured process for monitoring T2DM patients in a community setting. Quantitative methodology was also used, and the pre-and post-training questionnaire evaluated the knowledge and skills of participants before and after the training sessions. Several studies have used a similar approach to evaluate the effectiveness of a training program.²⁸⁻³¹ Pharmacists from both countries found the Simplertm tool comprehensive and useful in prompting them to deliver structured diabetes care and recommend clinical interventions. Similar benefits were reported in studies using a defined approach to aid decision making such as the intervention tool for prescribing antibiotics, asthma intervention tool for pharmacists, inappropriate medication use and prescribing indicators in the elderly Australian population and a dietary intervention tool.³²⁻³⁶ Participants' evaluation of the effectiveness of the Simplertm tool was similar to a hypothesis by Weed who suggested two important features in order for a tool to be effective: (1) the tool should enable information retrieval and organisation and (2) the tool should empower the user to use the information obtained and own judgement to make

an intervention.³⁷ While the intention of the tool is to facilitate the intervention process, pharmacists are expected to have prior knowledge in guideline recommended treatment for diabetes.

The training content was reported to be relevant to practice and increased pharmacists' knowledge of guideline-based diabetes management. Similar to other studies where pharmacists perceived increased confidence after training, the Simplertm training increased participants' confidence to deliver guideline adherent diabetes care in their practice settings. The average post-test marks (11.3 marks) in this study were lower than the full score (27 marks). The low scores may reflect participants' limited ability to detect clinical problems in the case study provided. The most likely cause hinges on the fact that the majority (75%) of participants had less than three years of managing patients with T2DM diabetes. In addition, participants were expected to have existing knowledge on practice guidelines to facilitate the intervention process. In this cohort, most pharmacists (66.7%) had never or only sometimes referred to the guidelines. This finding suggests that future training sessions should include diabetes practice guidelines as prerequisite reading material.

The content of the Simpler™ training module was informed by the results of a previous Australian pharmacists' diabetes pilot program during which pharmacists described the training being more theoretical than practical and requested more concise information.³⁸ Although this element guided the design of the Simpler™ training program some pharmacists identified a need to include more clinical information and lifestyle counselling points in the training content. To address this issue, additional materials were subsequently developed on pharmacotherapy management which summarised the thought process required to make pharmaceutical care interventions.³⁹ Similarly, two additional web links were added directing pharmacists to a list of counselling points on lifestyle management.^{40,41}

Documenting pharmacists' interventions into patients' medical record has not traditionally been practised by community pharmacists but is more common among hospital pharmacists.³⁹ Despite this, participants who completed the training expressed their willingness and were confident to record their clinical interventions. Information from patients' medical data expedites pharmacists' assessment of pharmacotherapy issues and enable them to make quality interventions.⁴² In this study, pharmacists from Australia who were unable to access it were less effective in making clinical interventions despite applying the Simpler™ tool. This finding suggests that while the Simpler™ tool helped to facilitate clinical interventions by pharmacists, access to patients' information, including laboratory data, is beneficial for its effective use and to make meaningful recommendations.

The aim of this pilot study is to explore pharmacist's perception of the Simpler™ tool and obtain suggestions for improvement. Thus, participants who are actively engaged in diabetes management service were purposively recruited using the snowball sampling. However, the risk of their views being biased towards a more positive response during the interview session is acknowledged, as was shown in other studies.⁴³ In addition, the small sample size from one state in Malaysia and one in Australia may not reflect the views of all pharmacists. The different presentation method of training, namely online and face-to-face workshops, may have influenced the pre-and post-training results. However identical content was delivered through both training approaches to minimise the differences. In addition, the evidence for effectiveness of the tool in practice settings was limited to pharmacists'

self-reported data on the number of interventions conducted. Therefore, independent evaluation of patients' clinical outcomes is needed to ascertain the value of pharmacists' interventions. Although all participants demonstrated improved knowledge and skills assessed through pre- and post-training results, there is a lack of evidence of the longevity of knowledge, specifically in terms of reinforcement of the information and application of knowledge and skills. The Simpler™ tool on the other hand incorporated a hand-out which remained with the pharmacists and therefore encouraged continued use. The tool was found to be feasible among pharmacists in Australia and Malaysia as both countries had similar diabetes guidelines and pharmacists from both countries provided diabetes management service.^{2,3,44,45} However, due to yearly updates on some guidelines, contents such as the therapeutic goals may have to be amended.

CONCLUSIONS

This was the first study to explore pharmacists' views on a structured diabetes intervention tool and training program to guide them in addressing each of the seven guideline required diabetes factors. The Simpler™ training program and tool proved to be a useful approach to upskill pharmacists and improve their confidence in delivering diabetes care. Pharmacists viewed the tool as relevant and beneficial in facilitating the provision of structured, evidence-based interventions in diabetes care.

ACKNOWLEDGEMENTS

The authors would like to thank the Director General of Health Malaysia for his permission to publish this article. We would like to extend our gratitude to all 12 participants in this study and Ms. Li Yun Chong for her help in participant recruitment. We also thank Mr. Mustafa Atee, Ms. Oiyammal Chelliah, Ms. Chew Beng Ng and Dr. Tin Fei Sim for their invaluable comments on the training modules; pre-and post-training questionnaires.

CONFLICT OF INTEREST

All authors have no financial disclosures or conflicts.

FUNDING

None.

References

1. Global Health Estimates 2016: Deaths by Cause, Age, Sex, by Country and by Region, 2000-2016. Geneva: World Health Organization; 2018.
2. Ministry of Health; Malaysia. Clinical practice guidelines. management of type 2 diabetes mellitus (5th Edition)2015: Available at: <http://www.moh.gov.my/penerbitan/CPG/CPG%20T2DM%202015.pdf> (accessed May 17, 2018).
3. The Royal Australian College of General Practitioners. General practice management of type 2 diabetes: 2016-2018. 2016: Available at: <http://www.racgp.org.au/your-practice/guidelines/diabetes/> (accessed May 17, 2018).
4. National Institute for Health and Care Excellence (NICE) UK. The management of type 2 diabetes2014; (1-54): Available at: <https://www.nice.org.uk/Guidance/NG28> (accessed May 17, 2018).
5. American Diabetes Association. Standards of medical care in diabetes. *Diabetes Care*. 2016;39(suppl 1):S1-S103.
6. World Health Organization. Global report on diabetes. Geneva: Geneva: WHO; 2016.
7. Ladhani NN, Majumdar SR, Johnson JA, Tsuyuki RT, Lewanczuk RZ, Spooner R, Simpson SH. Adding pharmacists to primary care teams reduces predicted long-term risk of cardiovascular events in type 2 diabetic patients without

- established cardiovascular disease: results from a randomized trial. *Diabet Med*. 2012 Nov;29(11):1433-1439. <https://doi.org/10.1111/j.1464-5491.2012.03673.x>
8. Nishita C, Cardazone G, Uehara DL, Tom T. Empowered diabetes management: Life coaching and pharmacist counseling for employed adults with diabetes. *Health Educ Behav*. 2013;40(5):581-591. <https://doi.org/10.1177/1090198112465088>
 9. Butt M, Mhd Ali A, Bakry MM, Mustafa N. Impact of a pharmacist led diabetes mellitus intervention on HbA1c, medication adherence and quality of life: A randomised controlled study. *Saudi Pharm J*. 2016;24(1):40-48. <https://doi.org/10.1016/j.jsps.2015.02.023>
 10. Samtia AM, Rasool MF, Ranjha NM, Usman F, Javed I. A multifactorial intervention to enhance adherence to medications and disease-related knowledge in type 2 diabetic patients in Southern Punjab, Pakistan. *Trop J Pharm Res*. 2013;12(5):851-6. <https://doi.org/10.4314/tjpr.v12i5.28>
 11. Mourão AO, Magalhães, Ferreira WR, Martins MA, Parreiras, Reis AM, Moreira, Carrillo MR, Gaede, Guimarães AG, Ev LS. Pharmaceutical care program for type 2 diabetes patients in Brazil: a randomised controlled trial. *Int J Clin Pharm*. 2013 Feb;35(1):79-86. <https://doi.org/10.1007/s11096-012-9710-7>
 12. Ayadurai S, Hattingh HL, Tee LBG, Md Said SN. A narrative review of diabetes intervention studies to explore diabetes care opportunities for pharmacists. *J Diabetes Res*. 2016;2016:5897452. <https://doi.org/10.1155/2016/5897452>
 13. Conley MP, Chim C, Magee CE, Sullivan DJ. A review of advances in collaborative pharmacy practice to improve adherence to standards of care in diabetes management. *Curr Diab Rep*. 2014;14(3):470. <https://doi.org/10.1007/s11892-013-0470-0>
 14. Luetsch K. Attitudes and attributes of pharmacists in relation to practice change – A scoping review and discussion. *Res Social Adm Pharm*. 2017;13(3):440-455. <https://doi.org/10.1016/j.sapharm.2016.06.010>
 15. Ayadurai S, Sunderland VB, Tee LBG, Hattingh HL. Consensus Validation of Simpler: A Tool to Improve Pharmacist Delivery of Quality, Evidence-Based Diabetes Care. *Curr Diabetes Rev*. 2018;14(6):565-575. <https://doi.org/10.2174/1573399814666171215115239>
 16. Eldridge SM, Lancaster GA, Campbell MJ, Thabane L, Hopewell S, Coleman CL, Bond CM. Defining feasibility and pilot studies in preparation for randomised controlled trials: development of a conceptual framework. *PLoS One*. 2016;11(3):e0150205. <https://doi.org/10.1371/journal.pone.0150205>
 17. Creswell JW. *Qualitative inquiry & research design : choosing among five approaches*. 3rd ed. Thousand Oaks: Sage; 2013.
 18. Morse JM. *Qualitative health research : creating a new discipline* 1st ed. Walnut Creek, CA: Left Coast Press; 2012.
 19. Awaisu A, Alsalmiy N. Pharmacists' involvement in and attitudes toward pharmacy practice research: A systematic review of the literature. *Res Social Adm Pharm*. 2015;11(6):725-748. <https://doi.org/10.1016/j.sapharm.2014.12.008>
 20. Kritikos VS, Saini B, Carter S, Moles RJ, Krass I. Factors influencing pharmacy students' attitudes towards pharmacy practice research and strategies for promoting research interest in pharmacy practice. *Pharm Pract (Granada)*. 2015;13(3):587. <https://doi.org/10.18549/PharmPract.2015.03.587>
 21. Steinar Kvale. *Interviews: An introduction to qualitative research interviewing*. Thousand Oaks, CA: Sage; 1996.
 22. Tong A. Consolidated criteria for reporting qualitative research COREQ : 32 item checklist for interviews and focus groups. *Int J Qual Health Care*. 2007;19(6):349-357. <https://doi.org/10.1093/intqhc/mzm042>
 23. Schensul JJ, LeCompte. MD. *Designing and conducting ethnographic research: An introduction*. Walnut Creek, CA: Altamira Press; 2010.
 24. IBM Corp. *IBM SPSS Statistics for Windows, Version 22*. Armonk, NY: IBM Corp.; 2013.
 25. Boyatzis R. *Transforming qualitative information:thematic analysis and code development*. Thousand Oaks, CA: Sage; 1998.
 26. QSR International Pty Ltd. *NVivo qualitative data analysis Software, Version 10*. 2012.
 27. eTG complete. Melbourne: Therapeutic Guidelines Limited; July 2017.
 28. Adepu R, Shariff A. Development, validation and implementation of continuous professional development programmes for community pharmacists. *Indian J Pharm Sci*. 2010;72(5):557-563. <https://doi.org/10.4103/0250-474X.78520>
 29. Battaglia JN, Kieser MA, Bruskiwitz RH, Pitterle ME, Thorpe JM. An online virtual-patient program to teach pharmacists and pharmacy students how to provide diabetes-specific medication therapy management. *Am J Pharm Educ*. 2012;76(7):131. <https://doi.org/10.5688/ajpe767131>
 30. Saini B, Shah S, Kearey P, Bosnic-Anticevich S, Grootjans J, Armour C. An interprofessional learning module on asthma health promotion. *Am J Pharm Educ*. 2011;75(2):30.
 31. Wheeler A, Fowler J, Hattingh L. Using an intervention mapping framework to develop an online mental health continuing education program for pharmacy staff. *J Contin Educ Health Prof*. 2013;33(4):258-266. <https://doi.org/10.1002/chp.21198>
 32. Antherens S, Tonkin-Crine S, Douglas E, Fernandez-Vandellos P, Krawczyk J, Llor C, Cals JW, Francis NA, Yardley L, Coenen S, Verheij T, Goossens H, Little P. General practitioners' views on the acceptability and applicability of a web-based intervention to reduce antibiotic prescribing for acute cough in multiple European countries: a qualitative study prior to a randomised trial. *BMC Fam Pract*. 2012;13:101. <https://doi.org/10.1186/1471-2296-13-101>
 33. Litvin CB, Ornstein SM, Wessell AM, Nemeth LS, Nietert PJ. Use of an electronic health record clinical decision support tool to improve antibiotic prescribing for acute respiratory infections: The ABX-TRIP study. *J Gen Intern Med*. 2013;28(6):810-816. <https://doi.org/10.1007/s11606-012-2267-2>
 34. Murphy A. The community pharmacy SIMPLE approach to asthma management: Regional innovation fund (RIF) project evaluation report. Leicester City University Hospitals of Leicester, Trust N;2012.
 35. Basger BJ, Chen TF, Moles RJ. Inappropriate medication use and prescribing indicators in elderly Australians: Development of a prescribing indicators tool. *Drugs Aging*. 2008;25(9):777-793. <https://doi.org/10.2165/00002512-200825090-00004>

36. Paxton AE, Strycker LA, Toobert DJ, Ammerman AS, Glasgow RE. Starting the conversation performance of a brief dietary assessment and intervention tool for health professionals. *Am J Prev Med*. 2011;40(1):67-71.
<https://doi.org/10.1016/j.amepre.2010.10.009>
37. Weed LL. New connections between medical knowledge and patient care. *BMJ*. 1997;315(7102):231-235.
<https://doi.org/10.1136/bmj.315.7102.231>
38. Jim Hales AA, Tim Staniford, Jane Manser. Evaluation of the diabetes pilot program: final report. Canberra: Australian Government; 2010.
39. Hepler CD, Strand LM. Opportunities and responsibilities in pharmaceutical care. *Am J Hosp Pharm*. 1990;47(3):533-543.
40. Nutrition Society of Malaysia. Nutriweb. Malaysia2016; Available at: <http://www.nutriweb.org.my/index.php?healthy-eating-section> (accessed May 17, 2018).
41. The National Diabetes Services Scheme. Diabetes Australia. Available at: <https://www.ndss.com.au/publications-resources> (accessed May 17, 2018).
42. Spiro R. The impact of electronic health records on pharmacy practice. *Drug Topics*. 2012;(Apr):46-54.
43. Salter SM, Karia A, Sanfilippo FM, Clifford RM. Effectiveness of e-learning in pharmacy education. *Am J Pharm Educ*. 2014;78(4):83. <https://doi.org/10.5688/ajpe78483>
44. Pharmaceutical Services Division. Medication therapy adherence clinic (MTAC): Diabetes. Malaysia: Ministry of Health; 2014. Available at: <https://www.pharmacy.gov.my/v2/sites/default/files/document-upload/mtac-diabetic.pdf> (accessed May 17, 2018).
45. Pharmaceutical Society of Australia. Guidelines for pharmacists providing medicines use review (MedsCheck) and diabetes medication management (Diabetes MedsCheck) services. Available at: <https://www.ppaonline.com.au/wp-content/uploads/2019/01/PSA-MedsCheck-Guidelines.pdf> (accessed May 17, 2018).